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Research and application of metadata model facing to university informatization

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ABSTRACT

The text analyzes the necessity of information resources sharing by the research on metadata; and the metadata model of information resources sharing facing to the semantics has been designed on base the analysis of information resources sharing demand. The designed metadata model is based on the main body and capable of supporting the semantic description of the information resource and meeting the universality and particularity of information resource sharing; and meanwhile, with extension, the metadata model can realize the interconnection, interworking and interoperability of the information resource. The metadata standard template of the information resource is primarily realized by the entity class, attribute description of entity class and relation description of entity class as well as the information source metadata.

KEYWORDS

Metadata; Information source; Semantics; MST.

INTRODUCTION

With the continuous improvement of science and technology, the information era is coming and the network technology is developed rapidly; there are different units in different industries and organizations; and the units have different work centralities and targets, so they have internal information system and resource. The distribution of the system and resource depends on the distribution of business or specialized knowledge; usually, under different working environments, the different departments models the information resource by different concepts according to the work centrality and target so as to manage the internal information of the department. Because of different systems, the information among different departments or different units is not shared; and the resource is wasted in a qualified sense. The different unit models trouble realizing the information sharing. At present, how to realize sharing and exchanging the information resource and use the resource effectively is the problem urgent to be solved.

Metadata is a hot concept in domestic at preset; it can be understood as the foundation of information resource management and sharing; and it is the data of the data and the foundation of organization, storage, management, discovery, searching and application information resource. The metadata model models the metadata uniformly to provide a tool and means to distribution and heterogeneous information resource sharing. The metadata model based on the main body can promote the information sharing and semantic expression effectively; the semantic information here is the motion state and change form of real object; we understand it as the relation without information and program instead of meaning information capable of being understood by the computer program. The metadata model based on by the main body can provide searching and information collection ability to different users; and the expression form is to show the metadata model by the main body. However, there is a problem in the aspect; the foundation based on the information sharing of the main body is assumed as a concentrated main body of the sharing; it results in great consumption in the maintenance. In the network, the information resource of each department is maintained by the node; the concentrated whole main body does not exist; and the assumption is invalid.

The text analyzes the present metadata demand, namely, a set of complete metadata model; the model can be operated based on the semantics and supported by the description norm. Aiming at the above demand, the model framework facing to the information sharing service and semantics information sharing is designed; the above framework and the corresponding metadata model are introduced; and finally, the description specification of the metadata model is put forwards to support the designed metadata model.

DEMAND ANALYSIS AND DESIGN THOUGHT

The metadata model needed to design in the text is based on semantic overlay network and operation; this semantic overlay network is based on information network; and thus completes the distributed and heterogeneous information resources management. Information resource center network is similar to the wide-area distributed environment, which is technically independent from each information resource center interconnect formation. The semantic overlay network can connect different information resources distributed environments in different departments through metadata based on this discovery, organization and use of information resources so as to achieve efficient and secure sharing of information science purposes.

Demand analysis

The text aims at designing metadata model to achieve the purpose of sharing information resource; and the metadata must meet the following demands:

Firstly, the information resources are composed of many departments, so the data format is different and has the strong heterogeneous characteristics. In order to achieve information interconnection, interoperability and interoperability, we consider adopting the uniform standard model

when designing the metadata. Secondly, generally speaking, the designed metadata model covers many fields of information resource design and has wide distribution, so the metadata designed in a certain range must give the universality in a certain range, cover the object entity as far as possible and adapt to the special demands of different entities. And then, in the metadata model covering environment, users should be able to complete a search of concern information resources, and can access the information resource in the range. Fourthly, the information resource in the sharing range is complicated; when designing the metadata model, the intelligibility of the information resource is ensured; it means that the computer program understands the information to the meaning layer, namely, the information resource description ability facing to the semantics so as to meet the special demands of different users. Finally, the designed metadata model is capable of being extended and supporting interoperability and interoperability.

Design concept of metadata

The whole metadata is divided into three levels by the demand analysis of metadata model. The first level is rule and method which are abided by when designing the information resource; it is also named as the metadata model which is an abstract metadata for regulating the function, format, semantics and the like of the metadata. The second is the definition of metadata model which describes the rule collection of the specific object of some information in the information resource; the level is also named as the metadata template layer, namely the MST in the first level. The information resource with different fields and types has different MST; the metadata template describes the semantics rules of the special information resource completely; and the semantics rules here are applied to the data collection, semantics definition as well as rule and computer use of the specific information resource. When the MST is fixed, each kind of user must abide the metadata of special information resource object contained in the metadata template. The third level is used for recording the metadata; the metadata record is the application of the metadata and set up by the data model to describe the special information resource object; the metadata record must describe the special information source object, locate and manage the information source object, so that the users can discover, obtain and use the information resource object conveniently. The three-level metadata framework figure is as shown in Figure 1.
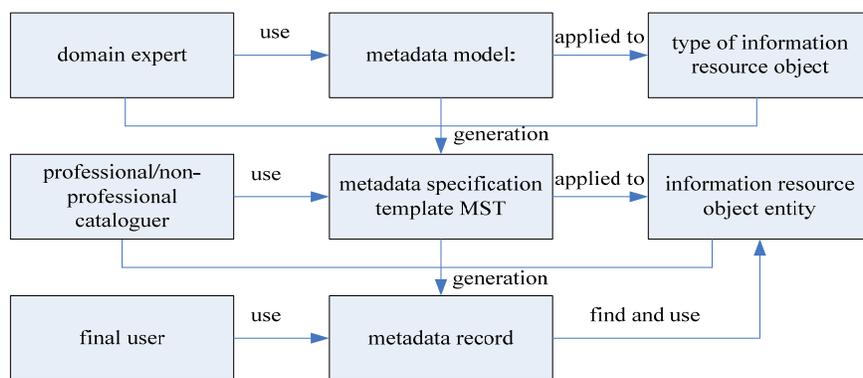

Figure 1 : Frame relation figure of three-layer metadata

MODEL DESIGN

Metadata is structured data, the information contained in the metadata can be understood and processed by a computer, it can be used to describe the attributes of a class and provide information resources to locate and manage information resources, and can be provided to users so as to search the information contained in the message. The text aims at building an information resource sharing platform, then the basis of this platform is planned and standardized information resource metadata structure. The metadata in the metadata model is built on abstract metadata which is the regulation for

formats and semantic grammar and other content at a higher level; and it is the rule and method to be abided when designing the metadata template; and the metadata template is the template used when designing some special information resource object. In the text, the part adding semantics information to the metadata is provided with the design thought of the main body; the method based on the semantics method can describe the metadata well so as to collect and share the metadata. The introduction of the main thought means to describe the metadata template based on the related field by the main thought. Before designing the metadata model, it is necessary to know about the concept of the main body.

Introduction of related concept

As a concept, the main body appears in the field of philosophy firstly. From the philosophy angle, the main body concerns the abstract nature of objective things and is the special explanation of objective things. There are many definitions for the main body apart from the philosophy field; a recognized concept is that the main body is the clear, format and sharing description to the concept system; and the definition is from the explanation of R.Studer. Usually, the literal interpretation of the body is usually for research or scientific facts exist, with the rapid development of science and technology, the body has also been introduced in the computer field, and more and more widely used in artificial intelligence direction. To the direction of the knowledge of the project, the body usually refers to a specific set of terms which is assumed that a group display of the collection, this collection is assumed about the connotations of the term, but specific terms are used to describe a certain set of conditions to determine the display. Under normal circumstances, the body describes the concept of classification hierarchies, but usually the condition is more complex, the body needs constraint the meaning of the concept by a group of format based on the concept classification level. The concept can be defined by the formula (1):

$$O = \{C, R, A, I\} \tag{1}$$

O in the formula (1) refers to main body; it contains C, R, F, A, I five basic elements; C refers to a concept that refers to a concept in a broad sense, it can form the task and function to a layer structure according to the specific relation; R is the concept of association and represents the relationship between concepts and concepts; F is one of R and refers to a special relationship, but also that is, for an element, with respect to its former one element that is the only certainty; A means that concept should satisfy the axioms or axioms R satisfied, the basic elements are the same; I mean is the set of concepts of the strength of the body.

From the above definition, we can see that the main body is a concept model in fact; the model is the collection of the concept or definition of concept and relation and the abstract of object world; usually, the phenomenon is shown by the concept. The concept used in the model is defined by the clear constraint condition; the concept collection in the model is created out of nothing and recognized in the specific field; so used as the concept model for sharing the information source in the semantic level, it has excellent concept level; and it can support the logic language. Moreover, the concept model plays a role in other aspects; and the action is mainly reflected in the process for using and describing the metadata.

Model introduction

We have introduced the main body concept in details; the metadata model designed in the text is a model facing to the semantic information resource sharing based on the main body design; the information resource is composed of the information units; and we can describe the information resource by the research on the entity class in the information unit. Based on above understanding, we can design the metadata model by the formula (2):

$$MD := < E, A, L, H^c, R, I, F, P > \tag{2}$$

E in formula (2) refers to the collection of the entity class of information unit; A is the collection of base attribute and conformation attribute in the entity class; L refers to the collection of the range; H^C is the expression of relation among entity classes; the relation is the partial ordering relation; it is double-directional, delivery and two-level. R is different from R definition; R refers to the relation among the entity classes of the information unit; the relation can ensure the integrality of the information, so the relation is binary; I refers to the collection of the entity class in the information unit; F is the expression of function set of the information unit; the function set comprises attribute function, attribute value function, information unit example function and relation example function; finally, P is the constraint function set which refers to the collection that information unit entity class meets the value constraint and base constraint.

Metadata standard template

The metadata standard template is the MST mentioned in the first layer of metadata; the template comprises the core layer and extension layer according to the MST design. The core layer design is the general element facing to the information resource; the extension layer design faces to the special field and task and is the extension on the core layer. The corresponding core MST and extension MST are formed by the design of core layer and extension layer metadata structure. Based on the above description, we can define the standard template of the metadata from the entity class, entity class attribute description, entity relation and information source metadata; we do not repeat the definition for MST elements; and it is necessary to describe the metadata. The foundation item in the information is necessary; it can be selected and empty; the information item can be extended and separated from the information source; the information source and information class can be managed dynamically by the important level and dynamic coefficient and corresponding measures. One class in the information attribute is the key attribute identifies; the value of the information item is the key for marking the attribute; if necessary, it can be modified manually. According to the above definition and description, the core metadata template is taken as the example to carry out the description. It has already been mentioned that the core metadata standard template faces to the general element of the information resource under the semantic information environment; and description for information resource and management element are taken as example to describe core MST.

The structure figure of the description for the information resource element is as shown in Figure 2:
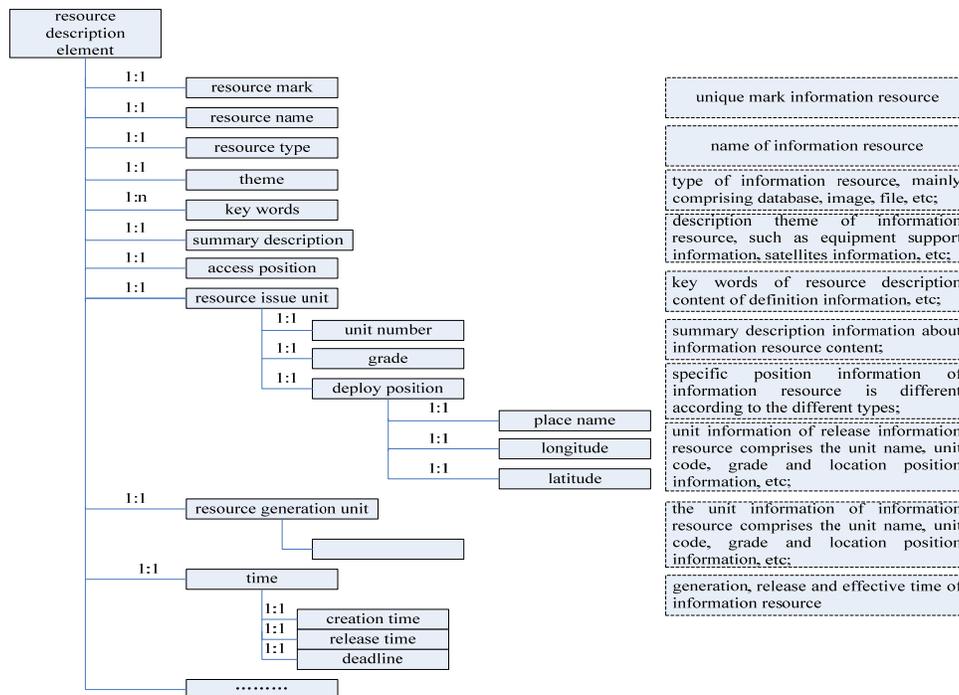

Figure 2 : Structure figure of description element of information resource

The information resource description element is the metadata for describing or marking the information resource object; and it is mainly used for describing the appearance features and main information. The management element of the information resource refers to the metadata supporting the information resource object network management; and the structure is as shown in Figure 3:
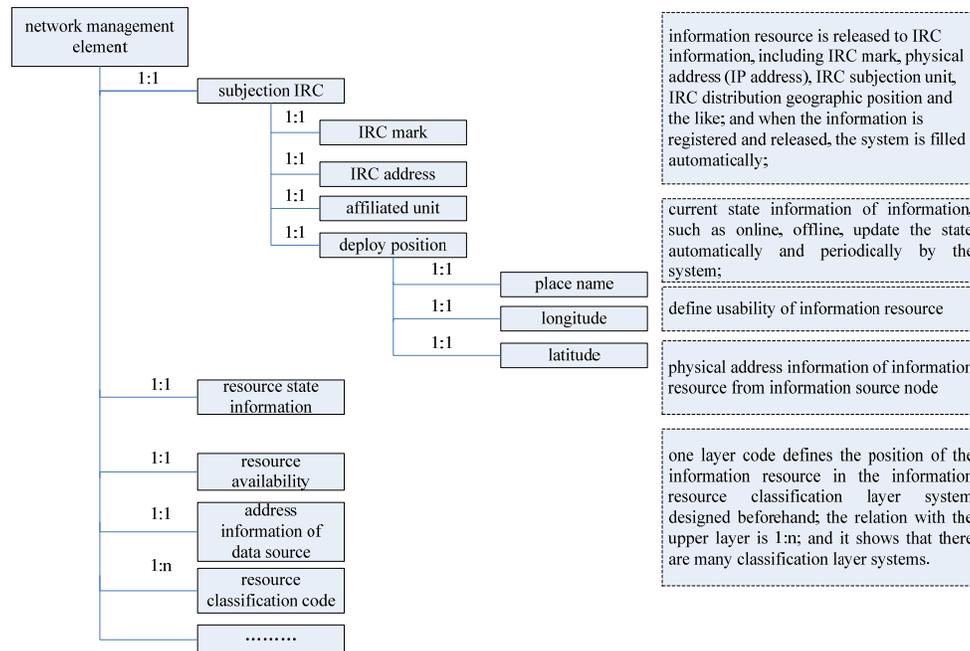

Figure 3 : Structure figure of management element of information resource

The resource availability in Figure 3-2 is obtained by the reliability and accuracy weight average; the accuracy is provided with an initial value at the initial state; and then it is graded according to the users' feedback; the grading system is averaged to obtain a value; the reliability is directly provided with a value when checking the resource; and the two values are between 0 and 1.

CONCLUSION

The text introduces the concept of the metadata and main body, analyzes the necessity of information resource sharing and designs the metadata model of information resource sharing facing to the semantics based on analyzing the information resource sharing demand. The designed metadata is based on the main body and capable of supporting the semantics description of the information resource and meeting the universality and particularity of information resource sharing. The content in the part is mainly realized by the core and extended metadata; the metadata model can meet the universality and particularity and has extension to realize the interconnection, interworking and interoperability of information resource. Apart from meeting the feasible operation demands based on semantics, the metadata based on main body must support the designed model by the metadata standard template. In the text, the standard template of the metadata is defined by the entity class, entity class attribute description, relation description of entity class and information source metadata. The information sharing metadata model facing to the semantics in the text describes the relation among the attribute, example and entity class and lays foundation to construct the semantics covering network.

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